and teacher: Use this cover sheet for mailing or faxing.

ASSIGNMENT BOOKLET
SCN3260 Physics 30
Module 3 Assignment

FOR STUDENT USE ONLY	
Date Assignment Submitted: _____	(If label is missing or incorrect)
Time Spent on Assignment: _____	Student File Number: _____
	Module Number: _____

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Assigned Teacher: _____

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Teacher's Comments

_____
Teacher

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- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
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Physics 30

Learn veryWare

we explore

Electrical Phenomena

Module 3

Assignment Booklet

Red Deer Catholic Regional Schools
EDMONTON PUBLIC SCHOOLS
Calgary Board of Education
Alberta Education

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Lesson 1 Assignment	23	
Lesson 2 Assignment	19	
Lesson 3 Assignment	23	
Lesson 4 Assignment	21	
Lesson 5 Assignment	25	
Lesson 6 Assignment	29	
	140	

Teacher's Comments

Physics 30 Learn EveryWare
Module 3: Electrical Phenomena
Assignment Booklet
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This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Education, **http://www.education.gov.ab.ca**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**
- Tools4Teachers, **http://www.tools4teachers.ca**

Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

MODULE 3: LESSON 1 ASSIGNMENT

This Module 3: Lesson 1 Assignment is worth 23 marks. The value of each assignment and each question is stated in the left margin.

(23 marks) **Lesson 1 Assignment: Electrostatics**

(2 marks) **A 1.** Record your observations and explanations for each of the following objects that interacted with the charged globe of the Van de Graaff generator:

a. animal fur

b. aluminum pie plates

c. confetti

d. soap bubbles

There is more room for your response on the following page.

You will have a chance to revise some of your explanations by the end of this lesson.

(6 marks) **A 2.** As you saw in the opening activity for this lesson, objects were placed on the globe of the Van de Graaff generator.

In each case, electrons were transferred from the negatively charged globe of the Van de Graaff generator to each of the objects. The result was that individual objects became negatively charged.

Use what you have learned in this lesson to explain the behaviour of each of these objects after the Van de Graaff generator was turned on.

a. animal fur

b. metal pie plates

c. confetti

There is more room for your response on the following page.

(3 marks) **A 3.** Compare your explanations from A 2 with the explanations you developed in A 1 at the beginning of this lesson. Contrast the two sets of explanations to identify the most significant improvements that you have made to your explanations.

There is more room for your response on the following page.

(4 marks) **D 4.** Use your answers to the discussion questions D 1, D 2, and D 3, and the results of your other investigations to revise your explanation of how lightning gets its charge.

There is more room for your response on the following page.

You may be graded according to the following scoring criteria.

Discussion Scoring Guide

Principles involved: Static electricity				
Criteria	**Level 1 (Below Standard)**	**Level 2 (Approaching Standard)**	**Level 3 (Standard)**	**Level 4 (Above Standard)**
Knowledge				
Demonstrates understanding of the situation, physics principles and technology, and their connections.	Demonstrates a vague and sometimes incorrect understanding of the physics principles involved. Obvious irrelevant or missing information.	Demonstrates a basic understanding of the physics principles involved. May exhibit minor mistakes or vague information or application to the situation.	Demonstrates a good understanding of the physics principles involved and applies them properly to the given situation. All necessary information is given.	Demonstrates a superior understanding of the physics principles involved and their application to the situation. All applications are considered in detail.
Reflection				
The post shows reflection on one's own and other students' work. Contributes to the group discussion.	Does not make an effort to participate. Seems indifferent to discussion.	Occasionally makes meaningful reflections on the group's efforts or discussions. Marginal effort is shown to become involved with the group or discussion.	Frequently makes meaningful reflections on the group's efforts and presents relevant viewpoints for consideration by the group. Interacts freely with group members.	Regularly attempts to motivate the group discussion and delve deeper into concepts. Interacts freely and encourages all group members.

Content and presentation of discussion summary				
The information is logically arranged in a clear and concise manner.	The information is poorly organized with many concepts implied. Irrelevant or rambling sentences make reading difficult.	The information is somewhat organized with implied concepts. Excessive words or awkward sentences are used, which hinder reading.	The information is well-organized and logically arranged. All concepts are explicitly explained. There are a few awkward but understandable sentences.	The information is well-organized and very easy to understand. Well-worded sentences make reading pleasurable.

(8 marks) **A 4.** Do question 10 of "10.1 Check and Reflect" on page 523 of your textbook.

b.

There is more room for your response on the following page.

c.

MODULE 3: LESSON 2 ASSIGNMENT

This Module 3: Lesson 2 Assignment is worth 19 marks. The value of each assignment and each question is stated in the left margin.

(19 marks) **Lesson 2 Assignment: Investigating Coulomb's Law**

(3 marks) **A 1.** Answer "Applications" problem 25 a. through d. on page 541 of your textbook.

(2 marks) b.

(5 marks) c.

(3 marks) d.

(2 marks) **A 2.** A student is investigating Coulomb's law. The student measures a force of $+2.00 \times 10^{-3}$ N between the two charged spheres.

a. Explain how you can tell whether the charges are both positive, both negative, or positive and negative.

(2 marks)

b. Describe two methods the student could use to increase the force to 64 times its current value?

(2 marks)

c. The student touches one of the spheres with a neutral sphere of equal size and then removes the neutral sphere. The student then moves one of the spheres so the distance is three times the original distance. What is the ratio of the original force to the new force?

MODULE 3: LESSON 3 ASSIGNMENT

This Module 3: Lesson 3 Assignment is worth 23 marks. The value of each assignment and each question is stated in the left margin.

(23 marks) **Lesson 3 Assignment: Applying Coulomb's Law**

(3 marks) **A 1.** Answer "Knowledge" problem 12 on page 540 of your textbook.

(8 marks) **A 2.** Answer "Applications" problem 8 on page 538 of your textbook.

a.

b.

(8 marks) **A 3.** Answer "Knowledge" problem 13 on page 540 of your textbook.

a.

b.

(4 marks) **A 4.** Answer “Applications” problem 24 on page 540 of your textbook.

MODULE 3: LESSON 4 ASSIGNMENT

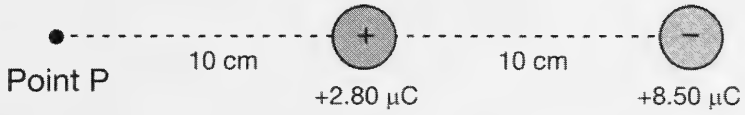
This Module 3: Lesson 4 Assignment is worth 21 marks. The value of each assignment and each question is stated in the left margin.

(21 marks) **Lesson 4 Assignment: Electric Fields**

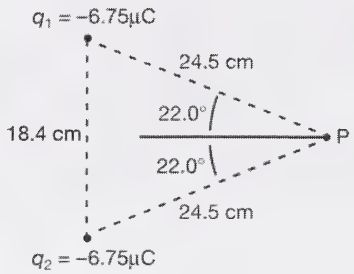
(4 marks) **A 1.** Calculate and illustrate the electric field strength at a distance of 8.25 m from a +6.50 μC charged particle. Use the simulation to verify your field diagram.

(3 marks) **A 2.** Calculate how far from a -5.00 μC charged particle the electric field strength 7.2×10^{7} N/C is toward the charge.

(4 marks) **A 3.** Point P is collinear with a +2.80 μC and a -8.50 μC as shown in the following diagram. Point P is 10 cm to the left of the positive charge and 20 cm to the left of the negative charge. What is the electric field at point P?



(6 marks) **A 4.** The following diagram shows two charged spheres arranged to the right of a point in space labelled P. Use the information on the diagram to calculate the magnitude and direction of the net electric field at point P.



(4 mark) **D 4.** Use your answers to D 1, D 2, and D 3 and those of the other responses to revise your explanation of why St. Elmo's fire occurs on sharply pointed projections of aircraft and not on flat exterior surfaces or interior surfaces.

You may be graded according to the following scoring criteria.

Discussion Scoring Guide

Principles involved: electric fields, electrostatic forces, conservation of charge				
Criteria	**Level 1 (Below Standard)**	**Level 2 (Approaching Standard)**	**Level 3 (Standard)**	**Level 4 (Above Standard)**
Knowledge				
	Demonstrates a vague and sometimes incorrect understanding of the physics principles involved. Obvious irrelevant or missing information.	Demonstrates a basic understanding of the physics principles involved. May exhibit minor mistakes or vague information or application to the situation.	Demonstrates a good understanding of the physics principles involved and applies them properly to the given situation. All necessary information is given.	Demonstrates a superior understanding of the physics principles involved and their application to the situation. All applications are considered in detail.

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MODULE 3: LESSON 5 ASSIGNMENT

This Module 3: Lesson 5 Assignment is worth 25 marks. The value of each assignment and each question is stated in the left margin.

(25 marks) **Lesson 5 Assignment: Electric Potential Energy**

(2 marks) **LAB 1.** Describe the motion of a test charge in a non-uniform electric field.

_____

_____

(2 marks) **LAB 3.** In which direction must a test charge be moved within an electric field if potential energy is to be stored in the system?

_____

_____

_____

_____

_____

_____

(5 marks) **LAB 4.** Does the electric potential between a source charge and a test charge vary as the inverse square of the distance of separation? Describe a procedure that would enable you to collect the necessary data to answer this question.

(2 marks) LAB 5. Collect the necessary data according to the steps outlined in your procedure.

(5 marks) LAB 6. Analyze the data that you collected so that you can answer the question posed in the purpose of this lab activity.

There is more room for your response on the following page.

(2 marks) LAB 7. Describe the motion of a test charge in a uniform electric field.

(2 marks) LAB 8. Explain the motion of a test charge in a uniform electric field.

(2 marks) LAB 9. Explain why the equation $\left|\vec{E}\right| = \frac{kq_{source}}{r^2}$ cannot be applied in this situation.

MODULE 3: LESSON 6 ASSIGNMENT

This Module 3: Lesson 6 Assignment is worth 29 marks. The value of each assignment and each question is stated in the left margin.

(29 marks)

Lesson 6 Assignment: The Motion of Charges in Uniform Electric Fields

(2 marks) LAB 1. Summarize what you have learned from this simulation by stating what will happen when

a. a positive particle has an initial velocity opposite to the direction of the electric field

b. a positive particle has an initial velocity in the same direction as the electric field

(2 marks) LAB 2. Use physics principles to explain the motion you described in LAB 1.

There is more room for your response on the following page.

(2 marks) LAB 3. Describe the motion of a positive particle when the direction of its initial velocity is perpendicular to the direction of the electric field.

(2 marks) LAB 4. Use physics principles to explain the motion you described in LAB 3.

There is more room for your response on the following page.

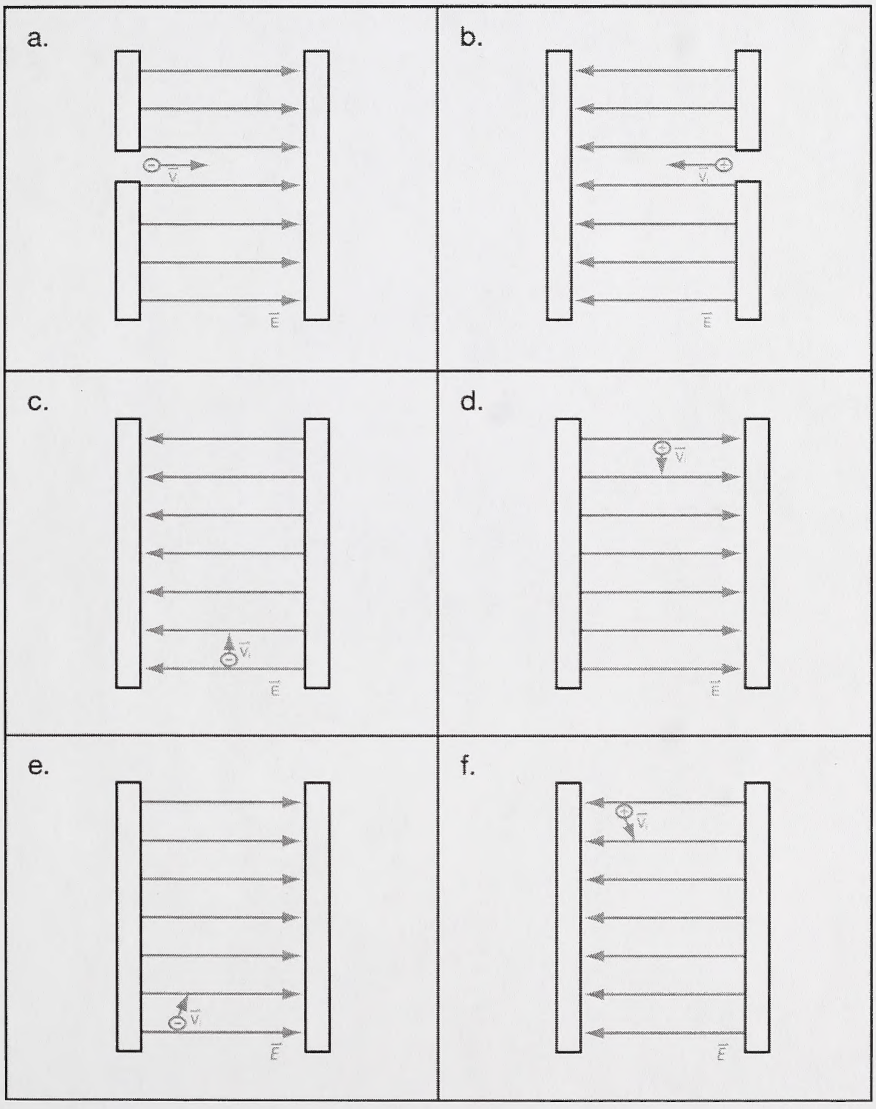
(2 marks) LAB 5. Describe the motion of a negatively charged particle when the direction of its initial velocity is perpendicular to the direction of the electric field.

(2 marks) LAB 6. Use physics principles to explain the motion you described in LAB 5.

(1 mark) LAB 7. Explain the circumstances that enable a particle to move un-deflected, with uniform motion, through an electric field, if it is given an initial velocity perpendicular to the electric field. Assume the electric field is the only field present.

(12 marks) A 1. In your Module 3: Lesson 6 Assignment, diagrams show the initial position and the velocity vector of a charged particle within a uniform electric field. For each diagram, follow each of these steps:

- Sketch a free-body diagram showing the net force that acts on the particle.
- Sketch the path of the particle.



(4 marks) **A 2.** The following diagram shows a proton entering the region between two oppositely charged plates. The plates are 45.0 mm long and 17.5 mm apart.

A potential difference of 0.208V generates an electric field between the plates. The proton is given an initial velocity of 1.35×10^4 m/s, in the positive x direction. Use this information to determine the y-component of the displacement of the proton when it leaves the region between the plates. (This displacement is how far the proton has moved above or below the x-axis the instant it leaves the region between the plates.)

Be sure to begin your solution with a free body diagram and an analysis of the physics principles that apply.